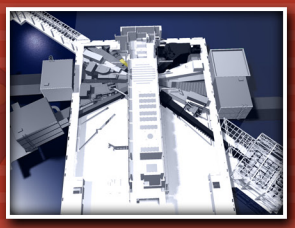
Instrument Fact Sheet

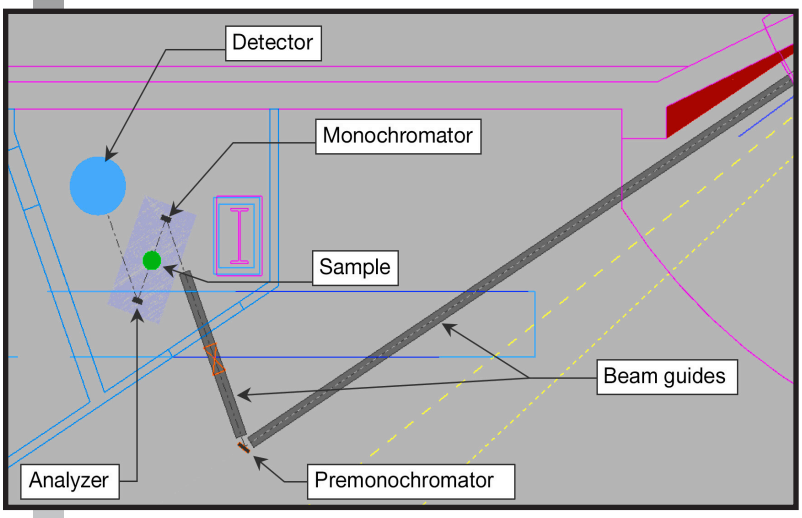
BEAM LINE 1A

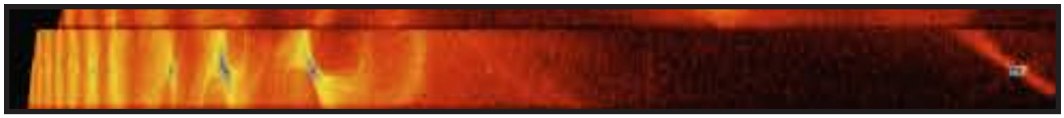
Spallation Neutron Source



TOF-USANS – Time-of-Flight Ultra-Small-Angle Neutron Scattering Instrument

The TOF-USANS instrument is designed for the study of hierarchical structures in natural and man-made materials. It can be considered an advanced version of the classical Bonse-Hart Double-Crystal Diffractometer (DCD), which, in contrast with its single-wavelength reactor-based analog, will operate with the discrete multiwavelength spectrum of Bragg reflections. The optical scheme of the TOF-USANS instrument is similar to that of the conventional Bonse-Hart DCD; however, the pulsed nature of SNS offers an opportunity to separate the orders of Bragg reflection in time space using the time-of-flight technique. Thus, the concept of the TOF-USANS technique allows optimization of the neutron flux and the Q resolution, following the principles of dynamical diffraction theory.





Discrete multiwavelength spectrum created by a family of Bragg reflections.

Specifications

Moderator	Decoupled poisoned hydrogen
Source-detector distance	30 m
Focusing premono-chromator	Germanium mosaic Ge(220) crystal
Monochro-mator and analyzer	Si(220) channel-cut, triple-bounce crystals
Bragg angle	70°
Wavelength spectrum	4 Bragg reflections at 3.6, 1.8, 1.2, 0.9 Å
Q range	7×10^{-6} Å^{-1} < Q < 5×10^{-3} Å^{-1}

Status:
To be commissioned in 2014

Applications

Ultra-small-angle neutron scattering provides a new way to solve a broad range of scientific problems such as:

- Supramolecular structure of polymer blends
- Macroscale self-similarity of rocks
- Structure of colloidal crystals and alloys
- Hydration of cement pasts
- Aggregation in colloidal dispersions
- Self-assembling of polymers
- Mesoscopic structure of natural composites
- Structure of granular powders
- Morphology of colloidal reinforcing fillers
- Structure and morphology of complex fluids
- Rheology and morphology of hydrogels

For more information, contact

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SNS

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